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Abdominal Mass in a Sprague-Dawley Rat

By James R. Swearengen and Georgina F. Miller

We received an eight-month-old male Sprague-Dawley rat (*Rattus norvegicus*) with an enlarged abdomen for examination. The rat was on a behavioral study and had not received any drugs since arriving from the vendor approximately six months earlier. Housing consisted of suspended polycarbonate caging with heat-treated hardwood bedding; the animal received rodent chow and water *ad libitum*. Environmental conditions provided 10-15 changes per hour of 100% conditioned fresh air, a temperature range of 24-25° C, relative humidity between 40-70%, and a 12 hour light:dark photoperiod with no twilight.

Physical examination revealed a grossly

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FIGURE 1. Abdominal tumor in an 8 month-old rat showing glomeruloid structure (curved arrow) and tubule (straight arrow) in a loose spindle cell stroma. Hematoxylin and eosin stain, high power.

distended abdomen; palpations elicited avoidance behavior. On further examination, we detected a large mass which filled the left upper and lower quadrants of the abdomen and extended across the midline. We noted no other clinical signs. Based on our examination findings and the rat's apparent discomfort, we decided to humanely euthanize the animal.

A necropsy revealed an 8 cm x 6 cm semi-firm mass which filled the left half of the abdominal cavity, displacing the visceral organs. The mass was oval in shape and predominately dark brown in color, with light brown streaks scattered throughout. We could not identify the left kidney; the mass arose from the expected location. A slender, tubular structure, grossly consistent with a ureter, originated from the mass, traversed the abdominal cavity and entered the urinary bladder at the trigone. The urinary bladder appeared hemorrhagic, but was of normal size and consistency. The right kidney was grossly unremarkable, and no other abnormalities were identified.

We immersed sections of the mass in 10% buffered formalin for fixation, and submitted them for histopathologic diagnosis.

Representative sections were embedded in paraffin, sectioned at 6 microns, and stained with hematoxylin and eosin.

The encapsulated mass was composed of indistinct lobules in which loosely arranged stromal cells surrounded and separated nests of epithelial cells. The nested epithelial cells were variably arranged in tubules or loosely to densely packed cellular aggregates. The aggregates were sometimes partially to completely surrounded by a one to three cell thick capsule, creating a glomeruloid structure (Fig. 1). The epithelial cells were noted to have cuboidal to columnar appearance with distinct cell borders. The nuclear to cytoplasmic ratio was 1:1 and the mitotic rate was low (1-2 per high power field). The stroma was composed of loosely arranged stellate cells and more closely compacted spindle cells. Also apparent were large areas of coagulative necrosis and hemorrhage.

With neoplasia as an obvious differential, what type of tumor is this, based on the histological findings? What age rat is most commonly affected? What is a common name for a similar tumor in humans? What are some animal models for the human occurrence of this tumor?

LAB ANIMAL welcomes reader contributions to "What's Your Diagnosis?" in the case history/diagnosis format presented here; submissions should include two to five illustrations or photos. If possible, please submit your manuscript on diskette and include two printed copies. Selections are made on the basis of relevance and interest to readers. Please address your submissions to Thomas M. Donnelly, c/o Editorial Dept., LAB ANIMAL, 65 Bleecker St., New York, NY 10012.

Spontaneous Nephroblastoma

The histologic diagnosis was nephroblastoma. Since this rat had only been used for a drugless behavioral study, and there was no history to suggest its dam had been exposed to drugs, we made a final diagnosis of spontaneous nephroblastoma.

Nephroblastomas arise from the renal blastema, from which the mammalian kidney derives, but which in early embryonic stages is not greatly differentiated from the primitive mesenchyme¹. The tumor has the capacity for differentiating along the epithelial pathway into tubular profiles and primitive glomeruli. The growth pattern generally observed for nephroblastomas is one of expansiveness with a limited tendency for local infiltration at the tumor periphery².

Spontaneous nephroblastomas in the rat are usually unilateral, and large tumors average between 3.0 and 4.5 cm in diameter³. These tumors are mostly seen in young rats, with a mean age of less than one year, and no apparent sex predilection⁴. The tumor described here was considerably larger (8 cm X 6 cm) than any previously reported.

In humans, the nephroblastoma—commonly called Wilms' tumor—is considered a childhood tumor particularly affecting 2-4 year-olds, and only rarely occurs in adults. Most children with this tumor have a large abdominal mass that, when very large, extends across the abdominal midline. Pain in the abdomen is usually only noticeable following some hemorrhagic incident or intestinal obstruction. The most common presentation in humans is an enlarged abdomen,

with or without discomfort, and has certain similarities to this case of spontaneous nephroblastoma in a rat.

Nephroblastomas have been induced in the rabbit and rat by in-utero exposure of offspring to N-ethylnitroso-urea^{5,6} and in the rat by injecting neonates with dimethylnitrosamine or weanlings with 1,2-dimethylhydrazine^{7,8}. Induced nephroblastoma in the rabbit has been compared and contrasted as an animal model of human disease to assist investigation of tumor pathogenesis and treatment strategies⁷.

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